CLAIMS

1) A method for substantially removing a common noise signal portion from electrical signals produced by an electrical signal source having a polarity reversal region with a centre, said electrical signals having inverse polarities on opposite sides of the centre, said method comprising:

a) sensing a first electrical signal of a first polarity through first electrodes located on one side of the centre;

b) sensing a second electrical signal of a second polarity through second electrodes located on the other side of said centre;

c) sensing a third electrical signal through third electrodes located between said first electrodes and said second electrodes;

d) combining the first and second electrical signals into a combination signal; and

e) combining the combination signal and the third electrical signal into an output signal.

2) A method for substantially removing a common noise signal portion as recited in claim 1, wherein:

- said first and second polarities are opposite polarities;

- combining the first and second electrical signals comprises subtracting one of the first and second electrical signals from the other of said first and second electrical signals to produce a combination signal substantially free from said common noise signal portion; and

- combining the combination signal with the third electrical signal comprises adding the combination signal and the third electrical

signal to produce said output signal still substantially free from said common noise signal portion and thereby substantially prevent output signal loss.

3) A method for substantially removing a common noise signal portion as recited in claim 1 or 2, further comprising differentially amplifying said first electrical signal, differentially amplifying said second electrical signal, and differentially amplifying said third electrical signal.

4) A method for substantially removing a common noise signal portion as recited in claim 1, 2 or 3, wherein sensing of said first, second and third electrical signals comprises forming with said first, second and third electrodes a series of electrodes having an axis extending through the centre of the polarity reversal region substantially in the direction of polarity reversal.

5) A method for substantially removing a common noise signal portion as recited in claim 1, 2, 3 or 4, further comprising applying said output signal substantially free from said common noise signal portion to a ventilatory assistance system.

6) A method for substantially removing a common noise signal portion as recited in claim 1, 2, 3, 4 or 5, wherein sensing of said first, second and third electrical signals comprises sensing first, second and third electromyographic signals, respectively, from at least one muscle of a patient, said at least one muscle constituting the electrical signal source.

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7) A device for substantially removing a common noise signal portion from electrical signals produced by an electrical signal source having a polarity reversal region with a centre, said electrical signals having inverse polarities on opposite sides of the centre, said device comprising:

a) a first input responsive to a first electrical signal having a first polarity sensed through first electrodes located on one side of the centre;

b) a second input responsive to a second electrical signal having a second polarity sensed through second electrodes located on the other side of said centre;

c) a third input responsive to a third electrical signal sensed through third electrodes located between the first electrodes and the second electrodes;

d) means for combining the first and second electrical signals into a combination signal; and

e) means for combining the combination signal and the third electrical signal into an output signal.

8) A device for substantially removing a common noise signal portion as recited in claim 7, wherein:

- said first and second polarities are opposite polarities;

- the first and second electrical signals combining means comprises means for subtracting one of the first and second electrical signals from the other of said first and second electrical signals to produce a combination signal substantially free from said common noise signal portion; and

- the means for combining the combination signal with the third electrical signal comprises means for adding the combination

signal and the third electrical signal to produce said output signal still substantially free from said common noise signal portion and thereby substantially prevent output signal loss.

9) A device for substantially removing a common noise signal portion as recited in claim 7 or 8, further comprising a first differential amplifier for amplifying said first electrical signal, a second differential amplifier for amplifying said second electrical signal, and third differential amplifier for amplifying said third electrical signal.

10) A device for substantially removing a common noise signal portion as recited in claim 7 or 8, wherein said first, second and third electrodes form a series of electrodes having an axis extending through the center of the polarity reversal region substantially in the direction of polarity reversal.

11) A device for substantially removing a common noise signal portion as recited in claim 7, 8 or 9, further comprising a ventilatory assistance system to which is supplied said output signal substantially free from said common noise signal portion.

12) A device for substantially removing a common noise signal portion as recited in claim 7, 8, 9, 10 or 11, further comprising means for extracting from said first, second and third electrical signals, a first, second and third electromyographic signals from at least one muscle of a patient, said at least one muscle constituting said electrical signal source.

13) A neuro-ventilatory efficiency computation method for monitoring/controlling the level of ventilatory assist produced by a ventilatory assistance system, comprising:

a) receiving a first signal representative of inspiratory effort and having a first amplitude;
b) receiving a second signal representative of a lung volume and having a second amplitude;
c) calculating a relation between said first and second amplitudes at predetermined intervals; and
d) increasing or decreasing the ventilatory assist level depending on whether a present calculated value of said relation is higher or lower than a past calculated value of said relation by an amount exceeding a given threshold.

14) A neuro-ventilatory efficiency computation method as in claim 13, wherein said relation calculating comprises calculating a ratio between said first and second amplitudes at predetermined time intervals.

15) A neuro-ventilatory efficiency computation method as in claim 13, wherein said relation calculating comprises calculating a ratio between said first and second amplitudes at intervals when one of said first and second amplitudes reaches a predetermined level.

16) A neuro-ventilatory efficiency computation method as in claim 13, 14 or 15, wherein the ventilatory assist level increasing or decreasing comprises increasing the ventilatory assist level when said present calculated value of said relation is higher than said past calculated value of said relation by an amount exceeding the given threshold, and

decreasing the ventilatory assist level when said present calculated value of said relation is lower than said past calculated value of said relation by an amount exceeding said given threshold.

17) A neuro-ventilatory efficiency computation method as in claim 13, 14, 15 or 16, wherein receiving the second signal representative of a lung volume comprises receiving a signal representative of a given lung volume.

18) A neuro-ventilatory efficiency computation method as in claim 13, 14, 15, 16 or 17, wherein receiving the first signal representative of inspiratory effort comprises receiving a signal representative of a given level of inspiratory effort.

19) A neuro-ventilatory efficiency computation method as in claim 13, 14, 15, 16, 17 or 18, further comprising generating an alarm signal when said present calculated value of said relation is higher or lower than the past calculated value of said relation by an amount exceeding said given threshold.

20) A neuro-ventilatory efficiency computation method as in claim 13, 14, 15, 16, 17, 18, or 19, comprising manually performing said increasing or decreasing of the ventilatory assist level.

21) A neuro-ventilatory efficiency computation method as in claim 13, 14, 15, 16, 17, 18, 19 or 20, comprising expressing the first signal representative of inspiratory effort as one of the following values: a mean

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of said first amplitude, a median of said first amplitude, and a peak of said first amplitude.

22) A neuro-ventilatory efficiency computation method as in claim 13, 14, 15, 16, 17, 18, 19 or 20, comprising expressing the second signal representative of a lung volume as one of the following values: a mean of said second amplitude, a median of said second amplitude, and a peak of said second amplitude.

23) A neuro-ventilatory efficiency computation method as in claim 13, 14, 15, 16, 17, 18, 19, 20, 21 or 22 wherein receiving the first signal representative of inspiratory effort comprises receiving an electromyographic signal from at least one muscle of a patient.

24) A neuro-ventilatory efficiency computation device for monitoring/controlling the level of ventilatory assist produced by a ventilatory assistance system, comprising:

a) a first input for receiving a first signal representative of inspiratory effort and having a first amplitude;
b) a second input for receiving a second signal representative of a lung volume and having a second amplitude;
c) means for calculating a relation between said first and second amplitudes at predetermined intervals; and
d) means for increasing or decreasing the ventilatory assist level depending on whether a present calculated value of said relation is higher or lower than a past calculated value of said relation by an amount exceeding a given threshold.

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25) A neuro-ventilatory efficiency computation device as in claim 24, wherein:

the calculating means comprises a divider responsive to the first and second amplitudes for calculating a ratio between said first and second amplitudes at predetermined intervals;

the increasing or decreasing means comprises:

- a comparator responsive to the present calculated value and the past calculated value of said relation for producing a signal representative of a comparison between a present calculated value of said relation and a past calculated value of said relation;
- an adder interposed between the comparator and the ventilatory assistance system for adding a preset increment to or subtracting a preset decrement from said ventilatory assist level when the comparison signal exceeds a given threshold.

26) A neuro-ventilatory efficiency computation device as in claim 24 or 25, wherein said calculating means comprises means for calculating said relation at predetermined time intervals.

27) A neuro-ventilatory efficiency computation device as in claim 24, or 25, wherein said calculating means comprises means for calculating said relation at intervals when one of said first and second amplitudes reach a predetermined level.

28) A neuro-ventilatory efficiency computation device as in any one of claims 25 to 27, wherein said adder comprises means for adding said preset increment to said ventilatory assist level when said present calculated value of said relation is higher than said past calculated value

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of said relation by an amount exceeding said given threshold, and means for subtracting said preset decrement from said ventilatory assist level when said present calculated value of said relation is lower than said past calculated value of said relation by an amount exceeding said given threshold.

29) A neuro-ventilatory efficiency computation device as in any one of claims 24 to 28, wherein the second signal representative of a lung volume is a signal representative of a given lung volume.

30) A neuro-ventilatory efficiency computation device as in any one of claims 24 to 28, wherein the second signal representative of inspiratory effort is a signal representative of a given level of inspiratory effort.

31) A neuro-ventilatory efficiency computation device as in any one of claims 24 to 30, further comprising an alarm generator to produce an alarm signal when said present calculated value of said relation is higher or lower than the past calculated value of said relation by an amount exceeding said given threshold.

32) A neuro-ventilatory efficiency computation device as in any one of claims 24 to 31, wherein said adder comprises a manual adjustment system to add said preset increment to or subtracting said preset decrement from said ventilatory assist level.

33) A neuro-ventilatory efficiency computation device as in any one of claims 22 to 32, comprising means for expressing the first signal representative of inspiratory effort by means of one of the following

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values: a mean of said first amplitude, a median of said first amplitude, and a peak of said first amplitude.

34) A neuro-ventilatory efficiency computation device as in any one of claims 24 to 32, further comprising means for expressing the second signal representative of a lung volume by means of one of the following values: a mean of said second amplitude, a median of said second amplitude, and a peak of said second amplitude.

35) A neuro-ventilatory efficiency computation device as in any one of claims 24 to 34, wherein the first signal representative of inspiratory effort is an electromyographic signal from at least one muscle of a patient.

36) A method for monitoring/adjusting the level of positive end expiratory pressure produced by a pressure assist device in relation to a signal representative of inspiratory effort in view of minimizing the level of pre-inspiratory effort, comprising:

a) receiving a signal representative of inspiratory flow;
b) calculating from said inspiratory flow signal an onset time for inspiration;
c) receiving a signal representative of inspiratory effort having an amplitude;
d) calculating a signal representative of pre-inspiratory effort in response to said onset time and said signal representative of inspiratory effort; and
e) increasing or decreasing the level of positive end expiratory pressure in relation to said signal representative of pre-inspiratory effort .

37) A method for monitoring/adjusting the level of positive end expiratory pressure as defined in claim 36, wherein increasing or decreasing the level of positive end expiratory pressure comprises increasing or decreasing the level of positive end expiratory pressure depending on whether the amplitude of said signal representative of pre-inspiratory effort is higher or lower than a given threshold.

38) A method for monitoring/adjusting the level of positive end expiratory pressure as defined in claim 37, wherein increasing of decreasing the level of positive end expiratory pressure comprises increasing the level of positive end expiratory pressure when said signal representative of pre-inspiratory effort is higher than said given threshold, and decreasing the level of positive end expiratory pressure when said signal representative of pre-inspiratory effort is lower than said given threshold.

39) A method for monitoring/adjusting the level of positive end expiratory pressure as defined in any one of claims 36 to 38, wherein increasing or decreasing the level of positive end expiratory pressure comprises increasing or decreasing one of the following parameters produced by said pressure assist device: a level of air flow, and a level of air volume.

40) A method for monitoring/adjusting the level of positive end expiratory pressure as defined in any one of claims 36 to 39, wherein calculating said signal representative of pre-inspiratory effort comprises

calculating said signal representative of pre-inspiratory effort at said onset time.

41) A method for monitoring/adjusting the level of positive end expiratory pressure as defined in any one of claims 36 to 39, wherein calculating said signal representative of pre-inspiratory effort comprises calculating said signal representative of pre-inspiratory effort during a period between the time when said signal representative of inspiratory effort reaches a minimum amplitude and said onset time.

42) A method for monitoring/adjusting the level of positive end expiratory pressure as defined in any one of claims 36 to 39, wherein:

a) calculating said signal representative of pre-inspiratory effort comprises calculating a period between the time when said signal representative of inspiratory effort reaches a minimum amplitude and said onset time; and
b) increasing or decreasing the level of positive end expiratory pressure comprises increasing or decreasing the level of positive end expiratory pressure depending on whether said period is higher or lower than a given limit.

43) A method for monitoring/adjusting the level of positive end expiratory pressure as defined in claim 39, wherein increasing or decresing the level of positive end expiratory pressure comprises increasing or decreasing the level of positive end expiratory pressure depending on both whether said period is higher or lower than the given limit, and whether the amplitude of the signal representative of pre-inspiratory effort is higher or lower than a given threshold.

44) A method for monitoring/adjusting the level of positive end expiratory pressure as defined in any one of claims 36 to 43, further comprising generating an alarm signal when said signal representative of pre-inspiratory effort is higher or lower than a given threshold.

45) A method for monitoring/adjusting the level of positive end expiratory pressure as defined in any one of claims 36 to 44, comprising manually performing the increase or decrease of the level of positive end expiratory pressure.

46) A method for monitoring/adjusting the level of positive end expiratory pressure as defined in any one of claims 36 to 45, comprising expressing said signal representative of inspiratory effort as one of the following values: a mean amplitude, a median amplitude, and a peak amplitude.

47) A method for monitoring/adjusting the level of positive end expiratory pressure as defined in any one of claims 36 to 46, wherein receiving said signal representative of inspiratory effort comprises receiving an electromyographic signal from at least one muscle of a patient.

48) A controller for monitoring/adjusting the level of positive end expiratory pressure produced by a pressure assist device in relation to a signal representative of inspiratory effort in view of minimizing the level of pre-inspiratory effort, comprising:

a) a first input for receiving a signal representative of inspiratory flow having an onset time for inspiration;

b) a second input for receiving a signal representative of inspiratory effort having an amplitude;

c) a computer device responsive to said onset time and said signal representative of inspiratory effort to compute said signal representative of pre-inspiratory effort; and

d) an adder/substractor for adding a preset increment to or subtracting a preset decrement from the level of positive end expiratory pressure in relation to said signal representative of pre-inspiratory effort .

49) A controller for monitoring/adjusting the level of positive end expiratory pressure as defined in claim 48, wherein the adder/subtractor comprises means for adding the preset increment to or for subtracting the preset decrement from the level of positive end expiratory pressure depending on whether the amplitude of said signal representative of pre-inspiratory effort is higher or lower than a given threshold.

50) A controller for monitoring/adjusting the level of positive end expiratory pressure as defined in claim 49, wherein the adder/subtractor comprises means for adding the preset increment to the level of positive end expiratory pressure when the signal representative of pre-inspiratory effort is higher than said given threshold, and means for subtracting the preset decrement from the level of positive end expiratory pressure when said signal representative of pre-inspiratory effort is lower than said given threshold.

51) A controller for monitoring/adjusting the level of positive end expiratory pressure as defined in any one of claims 48 to 50, wherein adder/subtractor comprises means for adding the preset increment to or subtracting the preset decrement from one of the following parameters produced by said pressure assist device: a level of air flow, and a level of air volume.

52) A controller for monitoring/adjusting the level of positive end expiratory pressure as defined in any one of claims 48 to 51, wherein said computer device comprises means for calculating said signal representative of pre-inspiratory effort at said onset time.

53) A controller for monitoring/adjusting the level of positive end expiratory pressure as defined in any one of claims 48 to 51, wherein said computer device comprises means for calculating said signal representative of pre-inspiratory effort during a period between the time when said signal representative of inspiratory effort reaches a minimum amplitude and said onset time.

54) A controller for monitoring/adjusting the level of positive end expiratory pressure as defined in any one of claims 48 to 51, wherein:

a) said computer device comprises means for calculating a period between the time when said signal representative of inspiratory effort reaches a minimum amplitude and said onset time; and
b) said adder/subtractor comprises means for adding said preset increment to or for subtracting said preset decrement from the level of positive end expiratory pressure depending on whether said period is higher or lower than a given limit.

55) A controller for monitoring/adjusting the level of positive end expiratory pressure as defined in claim 54, wherein said adding/subtracting means comprise means for adding the preset increment to or for subtracting the preset decrement from the level of positive end expiratory pressure depending on both whether said period is higher or lower than a given limit, and whether the amplitude of said signal representative of pre-inspiratory effort is higher or lower than a given threshold.

56) A controller for monitoring/adjusting the level of positive end expiratory pressure as defined in any one of claims 48 to 55, further comprising an alarm generator to produce an alarm signal when said signal representative of pre-inspiratory effort is higher or lower than a given threshold.

57) A controller for monitoring/adjusting the level of positive end expiratory pressure as defined in any one of claims 48 to 56, wherein said adder comprises a manual adjustment system for adding said preset increment to or subtracting said preset decrement from the level of positive end expiratory pressure.

58) A controller for monitoring/adjusting the level of positive end expiratory pressure as defined in any one of claims 48 to 57, comprising means for expressing the signal representative of inspiratory effort as one of the following values: a mean amplitude, a median amplitude, and a peak amplitude.

59) A controller for monitoring/adjusting the level of positive end expiratory pressure as defined in any one of claims 48 to 58, wherein the signal representative of inspiratory effort is an electromyographic signal from at least one muscle of a patient.